

The Office of Environment, Safety and Health and its Office of Nuclear and Facility Safety (NFS) publishes the Operating Experience Weekly Summary to promote safety throughout the Department of Energy (DOE) complex by encouraging feedback of operating experience and encouraging the exchange of information among DOE nuclear facilities.

The Weekly Summary should be processed as an external source of lessons-learned information as described in DOE-STD-7501-96, *Development of DOE Lessons Learned Programs*.

To issue the Weekly Summary in a timely manner, the Office of Operating Experience Analysis and Feedback (OEAF) relies on preliminary information such as daily operations reports, notification reports, and, time permitting, conversations with cognizant facility or DOE field office staff. If you have additional pertinent information or identify inaccurate statements in the summary, please bring this to the attention of Jim Snell, 301-903-4094, or Internet address jim.snell@hq.doe.gov, so we may issue a correction.

Readers are cautioned that review of the Weekly Summary should not be a substitute for a thorough review of the interim and final occurrence reports.

Operating Experience Weekly Summary 97-15

April 4 through April 10, 1997

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EVENTS

1. WORK PACKAGES DID NOT ADDRESS HAZARDS

Operating Experience Analysis and Feedback engineers reviewed two occurrence reports this week about personnel performing work under general maintenance work packages that did not address specific hazards associated with the work activities. The first occurrence involved subcontractor personnel exposed to a dielectric fluid they drained from capacitors. The second occurrence involved mechanics exposed to high airborne contamination and high levels of alpha contamination while inspecting wiring in an overhead area. These events are significant because the work packages were designed for general maintenance activities, such as changing light bulbs or dismantling equipment. The potential hazards of the task or the work area were not analyzed and addressed in the work packages, resulting in an increased risk to personnel safety. (OPRS Reports RFO--KHLL-NONPUOPS1-1997-0006 and SR--WSRC-HBLINE-1997-0004)

On April 1, 1997, at the Rocky Flats Environmental Technology Site, a facility manager learned that three subcontractors complained of feeling nauseous after smelling a sweet, sickening odor while draining dielectric fluid from capacitors on March 31, 1997. All three became physically ill, and one reported to Occupational Health the following day. The facility manager restricted access to the area and initiated an investigation and a health and safety review.

Investigators determined the subcontractor prepared a general maintenance work package for dismantling electrical equipment. The work package specifically stated the draining of open or closed chemical systems was not permitted. However, subcontractor personnel opened and drained the dielectric from the capacitors. The subcontractor did not perform a hazards analysis, provide a material safety data sheet for the dielectric, or contact the capacitor manufacturer for safety information. The subcontractors who drained the dielectric fluid did not wear any protective clothing or perform chemical air samples. The material safety data sheet for the dielectric shows the fluid contains di (2-ethylhexyl) phthalate, trichlorobenzene, and epoxide and phenolic stabilizers. Because di (2-ethylhexyl) phthalate is a known carcinogen, work areas containing this fluid should have good ventilation combined with local exhaust ventilation if the material is heated or misting. Personnel working with this fluid should wear rubber gloves, safety goggles, and respiratory protection if the fluid is misting or heated.

On April 1, 1997, at the Savannah River Site, a high-volume air monitor alarm actuated while three electrical and instrument mechanics inspected wiring in a room. One of the mechanics was working in an area above a dropped ceiling, over a glovebox. All three immediately evacuated the room. Radiological control operations technicians estimated the airborne level in the room reached 7,000 DAC. The mechanic who worked in the ceiling area had 1 million dpm alpha contamination on his protective clothing; those who stood on the floor below had 10,000 dpm alpha contamination. The mechanics performed the task under a general maintenance work package and a standing radiological work permit. They wore two pairs of protective clothing and fresh air hoods. Each of the mechanics will be given a 24-hour bioassay.

Two radiological control operations technicians re-entered the room and performed radiological surveys. They found that a junction box mounted in the ceiling above the glovebox had alpha contamination of 6.6 million dpm. The junction box did not have a cover and contained unterminated wires that penetrated the glovebox. General surveys of

the area indicated 40,000 dpm on a ladder used to get into the dropped ceiling and 20,000 to 1 million dpm on cable trays above the ceiling.

Investigators believe a mechanic may have stepped on the junction box, affecting the integrity of the glovebox penetration and resulting in the spread of contamination. The lack of complete identification and control of the job scope and the potential hazards of working above the glovebox may have contributed to the high levels of transferable contamination. Managers are reviewing the adequacy of work planning, work clearance, radiological work permits, and pre-job briefings. Managers identified corrective actions at a critique meeting. Corrective actions included performing a job hazards analysis on ceiling entries, investigating the adequacy of glovebox penetration design, and generating a job-specific radiological work permit for ceiling entries.

A similar event occurred on July 22, 1996, at the Los Alamos National Laboratory Chemistry and Metallurgy Research facility. An electrician received alpha contamination measuring 1,300 dpm on his right personal boot while installing new electrical conduit in the ceiling above a partially decontaminated chaseway. Because the work was to be performed in an uncontrolled area, the electrician did not wear any anti-contamination clothing to access the ceiling. However, the electrician entered the contaminated areas of the chaseway by way of the ceiling and should have been wearing protective clothing. Investigators determined that work organization/planning deficiency was a contributing cause. A corrective action requires radiological surveys of ceiling areas before performing any work in these areas. (ORPS Report ALO-LA-LANL-CMR-1996-0026)

These events underscore the importance of work planners preparing work packages that adequately address the potential job task and work area hazards. Job supervisors should instruct workers that all work is to be performed inside the bounds of the work package. If the existing job scope changes and new hazards are introduced, supervisors should stop the work until these hazards can be analyzed and appropriate protective measures can be incorporated. Managers should ensure that work control processes are followed and radiological protection practices are enforced. They should also ensure that all work-related hazards are evaluated to reduce worker exposure to hazards and to prevent injury. DOE 4330.4B, *Maintenance Management Program*, section 8.3.2, provides guidance on work requests and the need to address personnel safety and radiation protection requirements and permits for performing work. DOE-STD-1050-93, *Guideline to Good Practices for Planning, Scheduling, and Coordination of Maintenance at DOE Nuclear Facilities*, provides information on work controls and coordination. Section 3.4.2 describes the planning process and includes requirements for radiation permits.

KEYWORDS: work package, work planning, hazards analysis

FUNCTIONAL AREAS: work planning

2. NONCOMPLIANCE WITH FIRE PROTECTION INSPECTION SCHEDULE

On April 3, 1997, at the Oak Ridge National Laboratory, managers determined that a monthly inspection of the fire protection system for the Radiochemistry Engineering Development Center was not performed as specified in the operational safety requirements. The managers were conducting their annual surveillance of inspection records to verify compliance when they discovered that Fire Department personnel missed the November 1996 inspection. Investigators learned that the informal policy Fire Department personnel established for conducting these inspections was every 30 days,

but not to exceed 6 weeks. This issue is significant because failure to conduct surveillances and inspections at required frequencies violates operational safety requirements and technical safety requirements that represent the minimum acceptable controls necessary to ensure safe operation. (ORPS Report ORO--ORNL-X10REDC-1997-0002)

The operational safety requirement for the facility states that the surveillance and associated intervals required for the fixed fire protection systems shall be the applicable requirements specified in the fire equipment inspection, testing, and maintenance schedule of the Oak Ridge Operations Fire Prevention and Protection Policies. The fire protection manual requires a monthly inspection of the sprinkler system. This requirement differs from the present Fire Department informal policy of 30 days, but not to exceed 6 weeks. A previous inspection on October 24, 1996, and a subsequent inspection on December 12, 1996, showed the system to be in normal operating condition. Managers are investigating the incident to develop appropriate corrective actions and plan to hold a meeting with Fire Department personnel to formulate surveillance schedules.

Investigators determined that an effective method for tracking and scheduling surveillances does not currently exist at either the facility or the Fire Department. They also determined facility management's annual surveillance of inspection documentation to verify operational safety requirement compliance is less than adequate for identifying missed fire protection inspections.

A similar event occurred on January 3, 1996, at Hanford where the staff at a facility misinterpreted inspection due dates for wire rope inspections and allowed operators to use a crane more than 30 days after the last inspection had been completed. The staff interpreted "monthly" to mean one time each calendar month on any variable date. A 7-day grace period was added based on 25 percent of the established interval. The Office of Occupational Safety at the facility interpreted "monthly" as a period extending from a date in one calendar month to the corresponding date (30 days later) in the following month. (ORPS Report RL--WHC-TPLANT-1996-0001)

Operating Experience Analysis and Feedback (OEAF) engineers reviewed the Occurrence Reporting and Processing System (ORPS) database for missed or past-due surveillances and inspections across the DOE complex and found 38 occurrence reports. Figure 2-1 shows that facility managers reported management problems as the root cause for 66 percent of the occurrences. They also reported that personnel errors accounted for 18 percent of the occurrences. Further review shows that 36 percent of the management problems were reported as inadequate administrative control.

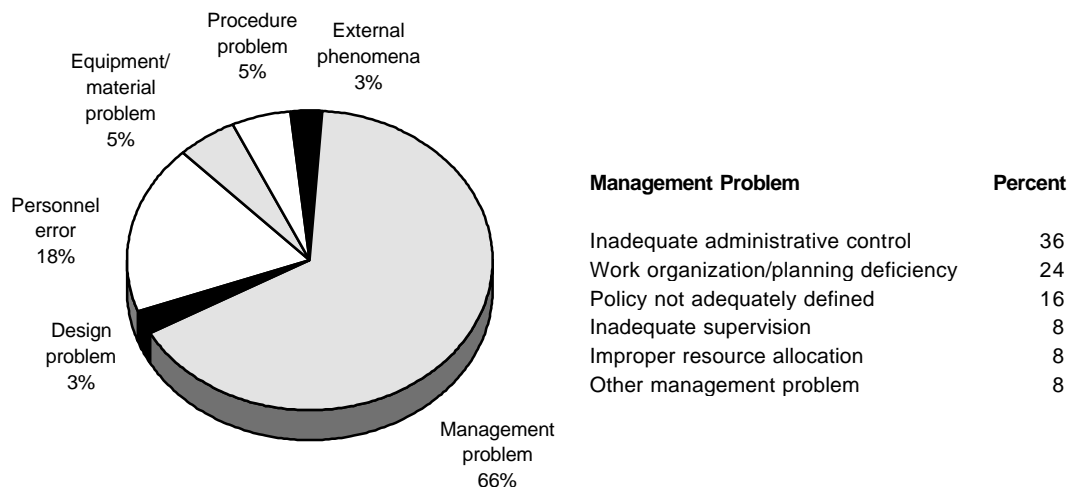


Figure 2-1. Distribution of Root Causes for Missed Surveillances¹

This event illustrates the importance of properly tracking, scheduling, and conducting surveillance inspections and tests. Annual reviews of surveillance testing should not be relied upon to ensure compliance. These reviews would be more appropriate if performed at the same interval as the inspection. Informal policies that affect other organizations' safety requirements should be reviewed by the affected organization's management before implementation to ensure compliance will not be compromised. DOE contractors operating nuclear facilities who fail to conduct required surveillances or implement corrective actions for identified deficiencies could be subjected to Price-Anderson civil penalties under the work processes and quality improvement provisions of 10CFR830.120, "Quality Assurance Requirements."

DOE facility managers should review their surveillance test procedures to ensure that scheduled frequencies are correct as specified in their safety documentation. DOE 5480.22, *Technical Safety Requirements*, general principle 1, states: "A system is considered operable as long as there exists assurance that it is capable of performing its specified safety function(s)." Surveillance testing is essential in providing this assurance.

KEYWORDS: surveillance, test, compliance, fire protection

FUNCTIONAL AREAS: surveillance, licensing/compliance, fire protection

¹ OEAF engineers reviewed the ORPS database for Nature of Occurrence "1G" (unsatisfactory surveillance/inspections) and Narrative Search "miss@,schedul@" and found 97 occurrence reports. A 100 percent review of these reports yielded 38 reports for missed surveillance testing.

3. **BUILDING EXHAUST FANS SHUT DOWN WHEN ELECTRICIANS DISCONNECT A CONDUIT**

On April 1, 1997, at the Rocky Flats Environmental Technology Center, electricians disconnected a conduit containing a wire common to three transducers, causing a shut down of the building exhaust fans. The loss of the fans caused a building limiting condition of operation to be exceeded. The electricians were using an approved work package for replacement of a flow transmitter. However, disconnecting the conduit was not included in the work package. When the electricians opened the cabinet to replace the flow transmitter, they noticed that a locking nut for the conduit was lying on the bottom of the cabinet. The electricians telephoned the building utilities engineer and asked if they could re-attach the locking nut, but they never communicated that the transducer were needed to be disconnected. The engineer gave them permission to proceed. Investigators determined the electricians did contact their supervisor and did not fully understand the implications of their request. Radiological control technicians surveyed the building after the ventilation system was restored and detected no spread of contamination. Failure to follow procedural requirements for work requests resulted in an operational safety requirement out of tolerance condition. (ORPS Report RFO-KHLL-771OPS-1997-0018)

When the electricians disconnected the wire, the control room stationary operating engineer noticed the decreasing differential pressure gauge reading for the radiological control area. He took immediate actions to restore building ventilation. He shut down the building supply fans and placed the fan controllers in manual operation to restore minimum ventilation and re-balance differential pressure in the radiological control area. The shift manager ordered the evacuation of the building radiological control areas until a contamination survey was conducted.

Investigators determined the building was in a planned out of tolerance of the operational safety requirement so electricians could perform maintenance on the ventilation system. The electricians failed to contact their supervisor to receive the proper review and authorization. Nuclear engineers determined that the authorization basis for the facility was not exceeded.

The facility manager directed maintenance management personnel to retrain the electricians on the work control process, procedural compliance, and maintaining the proper contact for work controls.

NFS reported violations of work controls and work outside the authority of work packages in Weekly Summaries 97-05, 97-03, 96-41, and 96-29.

- Weekly Summary 97-05 reported that on January 20, 1997, at Hanford, a design engineer shut down the exhaust fans for a contaminated building to verify as-built schematic drawings without using an approved work package. Survey results indicated there was no spread of contamination. (ORPS Report RL--BHI-DND-1997-0002)
- Weekly Summary 96-41 reported that on October 1, 1996, at the Oak Ridge Y-12 site, fire department personnel blocked a fire protection system master box without the knowledge or approval of the operations manager. A fire protection inspector blocked the box while connecting power to a fire

system in a de-energized building. (ORPS Report ORO--LMES-Y12NUCLEAR-1996-0021)

Operating Experience Analysis and Feedback (OEAF) engineers reviewed the Occurrence Reporting and Processing System (ORPS) database for occurrence reports with a direct cause of work planning deficiencies across the DOE complex and found 403 reports. Figure 3-1 shows that facility managers reported management problems as the root cause for 84 percent of the occurrences. Further review shows that 65 percent of the reported management problems were caused by work organization and planning deficiencies.

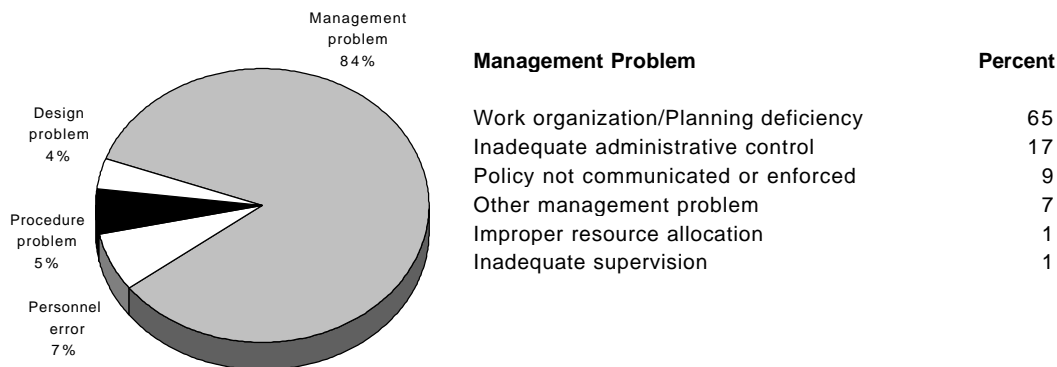


Figure 3-1. Distribution of Root Causes for Occurrences with a Direct Cause of Work Planning Deficiencies¹

This event illustrates the impact of performing work outside of or not authorized by an approved work package. Working without approved work packages and proper authorization places personnel, environment, and equipment at risk. It also demonstrates the importance of clear, succinct communications between workers. DOE 4330.4B, *Maintenance Management Program*, chapter 6, "Maintenance Procedures," identifies maintenance procedures and other work-related documents needed to provide appropriate work direction and ensure that maintenance is performed safely and efficiently. Chapter 8, "Control of Maintenance Activities," states that a work control program establishes the requirements for identifying, planning, approving, and conducting maintenance activities. Chapter 15, "Management Involvement," identifies the degree of management involvement in oversight and approval of maintenance and testing activities. The Order provides a definition of maintenance management and describes the types of work that should be controlled. DOE-STD-1050-93, *Guide to Good Practices for Planning, Scheduling, and Coordination of Maintenance at DOE Nuclear Facilities*, provides information on work controls and work coordination. DOE-STD-1031-92, *Guide to Good Practices for Communications*, discusses the need for clear, formal, and disciplined communications and provides guides to improve communications.

KEYWORDS: work planning, work controls, work package

FUNCTIONAL AREAS: work planning, procedure

¹ OEAF engineers searched the ORPS Graphical User Interface for Direct Cause "6B" (work planning deficiency) and found 403 reports.

4. INACCURATE DRAWINGS AND LABELS RESULT IN SHUT DOWN OF BUILDING EXHAUSTER

On April 2, 1997, at the Hanford Tank Farms, an electrician inadvertently activated two radiation alarms and shut down a building exhauster when he opened a circuit breaker that was identified as the power supply for some heat tracing tape. The electrician intended to de-energize the heat tracing tape as part of the annual de-winterization of the exhauster. When the exhauster shut down, the shift operations manager dispatched a person-in-charge to investigate. The person-in-charge found the circuit breaker open. He reclosed the circuit breaker, and the exhauster restarted. Shutdown of the exhauster could have resulted in the spread of contamination. Investigators determined that mislabeled equipment and inaccurate drawings resulted in the exhauster being inadvertently shut down. (ORPS Report RL--PHMC-TANKFARM-1997-0035)

Investigators determined the panel labeling and the drawing used for work package development showed that the breaker opened by the electrician should have been the proper isolation point for the heat tracing. However, further evaluation revealed that the wiring was not in accordance with the drawings. Investigators determined that power to the exhauster was supposed to be routed through a junction box and supplied from another circuit breaker, but it was actually wired to the circuit for the heat tracing.

The facility manager convened a critique to review this event. Critique members determined that after the breaker was opened an operator called the on-duty shift operations manager and informed him of the high radiation alarms for the exhauster. The shift operations manager misunderstood the information. He thought the operator was talking about another continuous air monitor that was scheduled for calibration. Critique members determined the procedure for de-winterization did not provide sufficient detail to properly complete the process.

The facility manager directed the following corrective actions.

- The operations manager will evaluate and revise the de-winterization procedure to provide clearer, more specific steps.
- Because of the misunderstanding about the alarms during the event, the operations manager will evaluate the adequacy of the alarm response section of the heating/ventilation system procedure, discuss the importance of proper communications, and provide communication guidelines at the weekly all hands meeting.
- The engineering manager will (1) review all engineering change notices to validate design versus field conditions, (2) verify that the panel schedule and the wiring to the connection box are in accordance with design, (3) evaluate the need to redesign the computer-automated surveillance system alarm for the exhauster, (4) conduct an engineering evaluation to determine if the exhauster is required to maintain a confinement function, and (5) revise the procedure and safety documents as necessary.

NFS reported configuration management issues in Weekly Summaries 97-13, 97-10, 97-04, 97-03, and several 1996 Weekly Summaries.

- Weekly Summary 97-04 reported on January 11, 1997, an electrician at Hanford received minor flash burns when he reconnected energized, 480-volt power leads to a motor control center main breaker. The electrician and a co-worker believed the circuit was de-energized based on their interpretation of electrical system drawings and an earlier zero energy verification. The electrician received only minor burns because he was wearing the required protective clothing. (ORPS Report RL--PHMC-S&W-1997-0001)
- Weekly Summary 96-28 reported on two events at the Savannah River Site. On July 2, 1996, at the In-Tank Precipitation Facility, electricians observed arcing when they cut an electrical cable they believed to be de-energized. The electricians used inaccurate drawings when de-energizing the cables. On June 26, at F-Canyon, operators detected contamination in the FB-line process water system after the valve to an incorrect supply water was opened. Operators were following a sketch included in the procedure. (ORPS Reports SR--WSRC-ITP-1996-0013 and SR--WSRC-FCAN-1996-0004)

Operating Experience Analysis and Feedback (OEF) engineers reviewed the Occurrence Reporting and Processing System (ORPS) database for occurrence reports with a direct cause of drawing, specification, or data errors across the DOE complex and found 200 reports. Figure 4-1 shows that facility managers reported design problems as the root cause for 46 percent of the occurrences. Further review shows that 82 percent of the reported design problems were caused by drawing, specification, or data errors.

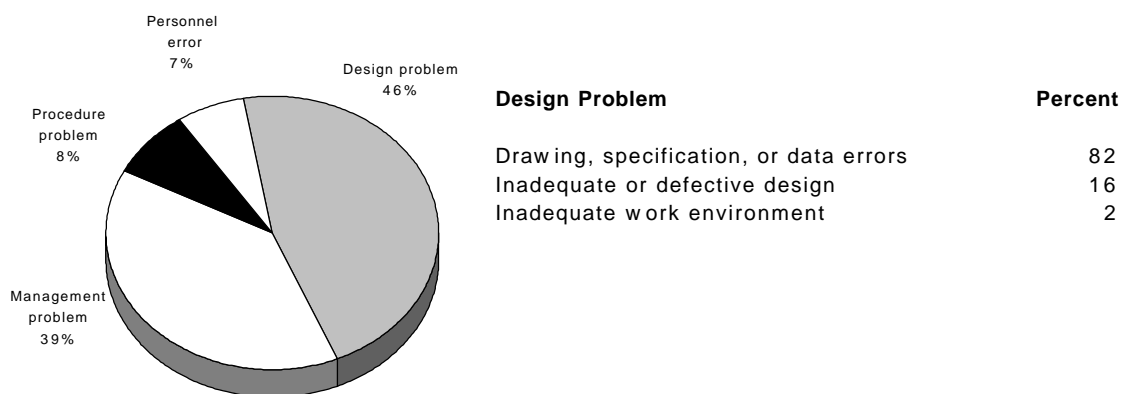


Figure 4-1. Distribution of Root Causes for Occurrences with a Direct Cause of Drawing, Specification, or Data Errors¹

¹ OEF engineers searched the ORPS Graphical User Interface for Direct Cause "4D" (drawing, specification, or data errors) and found 200 reports.

These events underscore the importance of accurate drawings, correctly labeled panels, and a disciplined configuration management program. When facility managers become aware that their facility drawings and panel labeling may be incomplete or inaccurate, additional safety steps should be incorporated into work controls and maintenance activities. DOE-STD-1073-Pt.1 and -Pt.2, *Guide for Operational Configuration Management Program*, states that physical configuration assessments or walk-downs should be performed for representative sample structures, systems, and components within the facility to determine the degree of agreement between the physical configuration and the configuration on the facility documentation. Physical walk-downs should be included as part of the programmatic assessments conducted during initial assessments, post-implementation assessments, and periodic effectiveness assessments. Facility managers should verify that these assessments include electrical drawings and system configuration as well as mechanical system drawings. DOE 5480.19, *Conduct of Operations Requirements for DOE Facilities*, requires systematic identification and control of design and facility information that is important to management and operation.

KEYWORDS: drawings, configuration management, electrical maintenance, labeling

FUNCTIONAL AREAS: configuration control, electrical maintenance, industrial safety

OEAF FOLLOW UP ACTIVITY

1. REQUEST FOR INFORMATION ON MAINTAINING SAFETY MANAGEMENT PROGRAMS

Management and Integrating contractors at DOE facilities have many obligations. Principal among them is the task of maintaining high safety standards when faced with the many challenges to their safety programs. Operating Experience Analysis and Feedback engineers believe that some of the more formidable challenges to safety programs are the following.

- changes in DOE requirements and regulations, including changes in orders and transition from use of orders to rulemaking
- changes in Management and Integrating contractor companies and changes in subcontract companies
- changes in DOE facility missions that affect the nature of the work to be performed
- loss of facility knowledge and experience through personnel attrition, turnover, and downsizing
- widely diverse facility hazards, missions, and operational lifetimes

These issues prompt us to ask readers of the Operating Experience Weekly Summary several questions about continuity of safety management at DOE. We intend to compile

this information and publish an article in a future Weekly Summary. We would appreciate your views on the following questions.

- How do you ensure that safety management programs are properly maintained in light of the challenges described in this article?
- How do you ensure that facility knowledge and experience are maintained in light of a changing workforce?
- How do you ensure compliance with appropriate standards and orders? What guidance is given to subcontract companies to ensure compliance?
- How do you ensure that authorization basis documents adequately address facility hazards in light of changing missions and facility configurations?
- How do you ensure that implementing procedures and documents accurately carry out the requirements of authorization basis documents?

The NFS Operating Experience Group is committed to customer satisfaction through continuous improvement of its products and services, including the Operating Experience Weekly Summary, and through reports to environment, safety, and health managers. We are also committed to taking a more proactive approach to the safety issues facing the DOE complex. Our request for information on safety management programs continues this proactive approach.

Individuals who would like to respond to this request may contact Neil MacArthur, (301) 540-2396, fax (301) 540-2499, or internet address neil.macarthur@hq.doe.gov; or Clifford Wallen, (301) 540-2396, fax (301) 540-2499, or internet address cwallen@dewey.tis.eh.doe.gov.

KEYWORDS: safety, management system

FUNCTIONAL AREAS: management